JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2010, **43,** 125–129 NUMBER 1 (SPRING 2010)

MANIPULATING SLOT MACHINE PREFERENCE IN PROBLEM GAMBLERS THROUGH CONTEXTUAL CONTROL

BECKY L. NASTALLY, MARK R. DIXON, AND JAMES W. JACKSON

SOUTHERN ILLINOIS UNIVERSITY

Pathological and nonpathological gamblers completed a task that assessed preference among 2 concurrently available slot machines. Subsequent assessments of choice were conducted after various attempts to transfer contextual functions associated with irrelevant characteristics of the slot machines. Results indicated that the nonproblem gambling group, but not the problem gambling group, increased their responding toward the slot initially trained as greater than following the initial training procedure, then decreased their responding toward that slot following the reversal phase.

Key words: contextual control, pathological gambling, relational frame theory, slot machine

Increasing research has been conducted on the effect of contextual control on the choices individuals make while gambling (Hoon, Dymond, Jackson, & Dixon, 2008; Johnson & Dixon, 2009; Zlomke & Dixon, 2006). For example, Zlomke and Dixon measured participants' preference for two concurrently available slot machines of equal payout (one yellow and one blue). The experimenters then delivered reinforcement to participants when they selected the comparison stimulus that was greater than the sample when the yellow contextual cue (background color) was present. Results indicated that 8 of 9 participants demonstrated a higher preference for the yellow slot machine in the posttest compared with initial exposure to the slot machines. These results suggested that the contextual cue (slot machine color) exerted control over responding.

Hoon et al. (2008) attempted to replicate the results obtained in the Zlomke and Dixon study (2006) using only two comparison stimuli at a time. The results indicated that following the nonarbitrary relational training and testing phases, 5 of the 6 participants demonstrated higher responding on the slot machine that shared properties with the function of the contextual cue for greater than. This effect of contextual factors on preference in a two-choice gambling paradigm also has been demonstrated with children using concurrently available dice of differing colors in a board game situation (Johnson & Dixon, 2009).

Although these studies demonstrate the effect of context on choice making in a gambling procedure, they are not without limitations. Perhaps one of the most glaring limitations that critics of behavioral research on gambling have noted is that these studies have not been conducted with participants who regularly gamble. Common characteristics of problem gamblers have been evaluated that may differ from nongamblers (Petry, 2005), and there is evidence of differences in the way this population values money (Dixon, Marley, & Jacobs, 2003).

In addition, the pretest–posttest design used in each of the studies discussed (Hoon et al., 2008; Johnson & Dixon, 2009; Zlomke & Dixon, 2006) often has been cited as a procedural limitation. Therefore, the purpose of the following study was to extend the literature already established in this area by incorporating problem gamblers as participants and adding a contingency reversal to the procedures (see Smyth, Barnes-Holmes, & Forsyth, 2006).

Address all correspondence to Mark R. Dixon, Behavior Analysis and Therapy Program Rehabilitation Institute, Southern Illinois University, Carbondale, Illinois 62901 (e-mail: mdixon@siu.edu).

doi: 10.1901/jaba.2010.43-125

METHOD

Participants and Screening

Fourteen adults (7 men, 7 women), 18 to 60 years old, who were actively recruited by the experimenter, served as participants in the study. Prior to being involved in the study, each participant was administered the South Oaks Gambling Scale (SOGS; Lesieur & Blume, 1987), and scores ranged from 0 to 20, with at least a 5 or more being indicative of a potential pathological gambling problem. The nonproblem gambling and problem gambling groups were made up of 7 participants each. There was a significant difference in SOGS scores among the problem gambling (M = 10.71, SD = 7.63) and nonproblem gambling (M = 0.29, SD = 0.49) groups, $t(12) = 3.608$, p = .003592. Participants were closely matched on variables such as age, income, and education level.

Setting and Apparatus

All sessions took place in a quiet setting while the experimenter monitored the session about every 10 min. All experimental sessions were conducted on a HP Pavilion laptop computer that was programmed in Microsoft Visual Basic 2005 and included a data-collection system.

Experimental Design and Procedure

The design was a within-subject pretest–posttest group design with a contingency reversal of the baseline discriminations.

Slot machine task (pretest, Posttest 1, and Posttest 2). A trial began with the participant reading the instructions on the screen and then clicking on a button to indicate a choice of playing on one of two concurrently available simulated slot machines. The slot machines were identical except that the machines were mostly blue or mostly yellow and were programmed on equal schedules of random-ratio (RR) reinforcement of 0.5 with magnitude of reinforcement held constant at one credit net gain or loss. Following a winning spin, two credits were added to the participant's "amount won" and "total credits" windows. These credits did not correspond with the participant's overall compensation, and although they appeared on the screen, did not hold any other meaning. The number of trials in this phase was randomly determined between 50, 70, and 90. This slot machine task also served as Posttest 1 and Posttest 2 and directly followed the nonarbitrary relational training and testing phase as well as the nonarbitrary relational training and testing with reversal phase.

Nonarbitrary relational training and testing. Following exposure to the slot machine task pretest, a nonarbitrary relational training procedure was presented to participants (see Hoon et al., 2008; Reilly, Whelan, & Barnes-Holmes, 2005). There were four separate sets of three gambling-relevant stimuli varying from least to most: jackpots (5 million, 10 million, 20 million), the word BINGO (B-I, B-I-N, B-I-N-G-O), coins (nickel, dime, quarter), and places (8th place, 3rd place, 1st place) in training and playing cards (4, 9, king), poker chips ($25, $100, $500), dollar bills ($1, $10, $50), and bottles of alcoholic beverages (1, 3, 7) in testing.

During a trial, either a blue or yellow screen appeared followed by two images positioned in the middle of the screen side by side. After the participant clicked on one of the images, a message appeared that read "correct" followed by a chime or "wrong" followed by a buzzer. The presence of the background color determined which selection of the two stimuli was reinforced. The set of contingencies each participant was exposed to was determined by preferential response allocation (≥70% of responses) in the pretest: If no preference emerged, the color chosen as the greater than cue was determined randomly, and the opposite color was chosen as the greater than cue if a preference did emerge. There were a total of 48 trials, and participants had to reach a criterion of 89% successive correct responding (43 of the

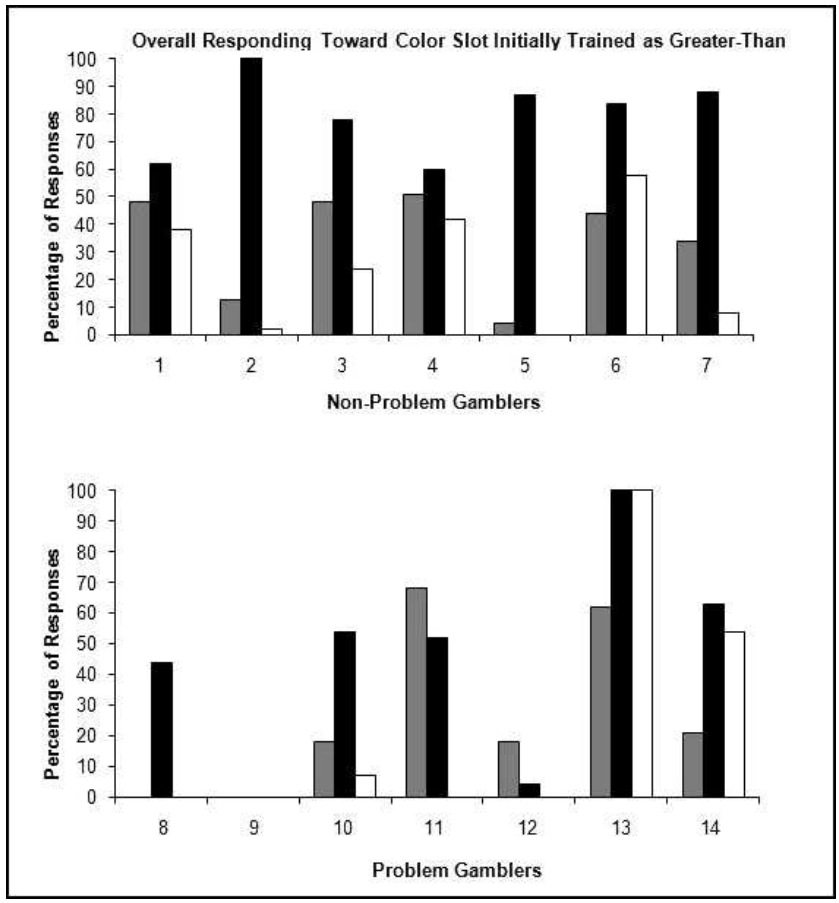

Figure 1. Responding toward the colored slot machine initially trained as the greater than contextual cue for both the nonproblem gambling (top) and problem gambling (bottom) groups in pretest (gray), Posttest 1 (black), and Posttest 2 (white).

48 trials). The relational testing phase was identical to the training phase except four sets of novel gambling-relevant images (listed above) were presented, and no feedback was given.

Slot machine task Posttest 1. If participants now showed higher responding toward the color slot machine trained as greater than as compared to pretest, they were reexposed to the slot machine task. However, if they allocated the same number of responses or fewer toward this slot machine, they were excused from the experiment at this point.

Nonarbitrary relational training and testing with reversal. This phase of the experiment was identical to the nonarbitrary relational training and testing procedure described above, except that the initial contingencies in place were now reversed.

Slot machine task Posttest 2. After reaching criterion responding in the testing phase, participants were reexposed to the slot machine task described above.

RESULTS AND DISCUSSION

Figure 1 shows the data for nonproblem and problem gamblers. Consistent with previous research, the nonproblem gambling group quickly met criterion on the initial relational training and testing phase, demonstrated a

predictable shift in preference for the color slot machine that was trained as the greater than contextual cue during training (Hoon et al., 2008; Zlomke & Dixon, 2006), and subsequently reversed their preference for that slot machine after the relational training and testing with reversal phase. Specifically, 3 participants from this group (P1, P3, and P4) achieved criterion for the initial relational testing within one trial block, 3 (P2, P5, and P7) after two trial blocks, and 1 (P6) following three trial blocks. All 7 participants in the nonproblem gambling group met criterion in the relational training and testing with reversal phase within one trial block. Figure 1 also shows that all participants in the nonproblem gambling group (P1 through P7) allocated a majority of responses toward the color slot machine that was trained as the greater than cue in Posttest 1 ($M = 80$, $SD = 14.5$). During Posttest 2, all participants (except P6) allocated less than 45% of their responses toward this same color slot machine ($M = 25$, $SD = 22.3$).

In contrast to prior research and our data obtained from the nonproblem gambling group, the problem gambling group required on average five times as many trial blocks to meet criterion in the initial relational training and testing phase and did not demonstrate predictable shifts in preference for the color slot machine trained as the greater than cue following each training and testing phase. In the problem gambling group, 3 participants (P9, P10, and P11) achieved criterion on the initial relational training and testing phase within two trial blocks, 2 (P12 and P13) after six trial blocks, 1 (P8) after eight trial blocks, and 1 (P14) after nine trial blocks. It is interesting to note that all participants in the problem gambling group who advanced to the relational testing with reversal phase (P8, P9, P10, P13, P14) reached criterion responding following exposure to one trial block. The data show that only 4 of the 7 participants in this group (P10, P11, P13, P14) allocated a majority of their responses toward the color slot machine trained as the greater than contextual cue following the initial relational training and testing phase ($M = 45$, $SD = 34.6$). Of the 4 participants who advanced to the second posttest, only 2 (P10 and P14) demonstrated a reduction of response allocation toward this slot machine following the relational training and testing with reversal phase ($M = 40$, $SD = 40.3$).

The conceptual implication of these findings is additional evidence for the effect of context on choice making in a gambling paradigm (Hoon et al., 2008; Zlomke & Dixon, 2006). More specifically, the contextual functions of the colors yellow and blue were transferred through multiple-exemplar training of the relations greater than and less than to the slot machines demonstrated by the preferential responding that emerged following exposure to one set of training contingencies initially and then a reversal of those contingencies. The study extended prior research by demonstrating a difference in the way these contextual factors affected participants based on their history of problem gambling.

To investigate differences that may emerge in he choice making of problem and nonproblem gamblers during gambling experiments, future studies should examine the role of verbal behavior, because both groups in this study were exposed to identical programmed contingencies. There has been evidence elsewhere of an increased self-governed rule adherence in clinical populations (Wulfert, Greenway, Farkas, Hayes, & Dougher, 1994), and some researchers have suggested that problem gamblers may be especially susceptible to maladaptive rule formation such as superstitious behavior or skill, rather than chance, producing positive outcomes (Delfabbro, 2004; Walker, 1992). For example, future studies could employ methods such as a talk-aloud procedure or postexperimental interviews to further examine the role of verbal rules. In addition, to

investigate the relation between derived relational responding and verbal rule formation related to gambling behavior, future studies should incorporate procedures that require the participant to derive some of the relations in the absence of direct training.

One obvious limitation in the current study was the small number of participants in each comparison group. To further increase the external validity of these findings, it would be advantageous to incorporate bigger sample sizes. However, demonstrating a significant difference between the two groups may indicate that the type of participant (problem or nonproblem gamblers) can make a difference when conducting behavioral investigations on gambling. This study provides preliminary evidence that researchers should be cautious when employing a nonclinical sample to investigate a clinical phenomenon.

REFERENCES

Delfabbro, P. (2004). The stubborn logic of regular gamblers: Obstacles and dilemmas in cognitive gambling research. *Journal of Gambling Studies*, *20*, 1–21.

Dixon, M. R., Marley, J., & Jacobs, E. A. (2003). Delay discounting by pathological gamblers. *Journal of Applied Behavior Analysis*, *36*, 449–458.

Hoon, A., Dymond, S., Dixon, M. R., & Jackson, J. W. (2008). Contextual control of slot machine gambling: Replication and extension. *Journal of Applied Behavior Analysis*, *41*, 467–470.

Johnson, T. E., & Dixon, M. R. (2009). Influencing children's pregambling game playing via conditional discrimination training. *Journal of Applied Behavior Analysis*, *42*, 73–81.

Lesieur, H. R., & Blume, S. B. (1987). The South Oaks gambling screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry*, *144*, 1184–1188.

Petry, N. M. (2005). *Pathological gambling: Etiology, comorbidity, and treatment*. Washington, DC: American Psychological Association.

Reilly, T., Whelan, R., & Barnes-Holmes, D. (2005). The effect of training structure on the latency of responses to a five-term linear chain. *The Psychological Record*, *55*, 233–249.

Smyth, S., Barnes-Holmes, D., & Forsyth, J. P. (2006). A derived transfer of simple discrimination and self-reported arousal functions in spider fearful and nonfearful participants. *Journal of the Experimental Analysis of Behavior*, *85*, 223–246.

Walker, M. B. (1992). Irrational thinking among slot machine players. *Journal of Gambling Studies*, *8*, 245–261.

Wulfert, E., Greenway, D. E., Farkas, P., Hayes, S. C., & Dougher, M. J. (1994). Correlation between self-reported rigidity and rule-governed insensitivity to operant contingencies. *Journal of Applied Behavior Analysis*, *24*, 659–671.

Zlomke, K. R., & Dixon, M. R. (2006). Modification of slot-machine preferences through the use of a conditional discrimination paradigm. *Journal of Applied Behavior Analysis*, *9*, 351–361.

Received October 1, 2008
Final acceptance March 7, 2009
Action Editor, Chris Ninness